

UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
OFFICE OF NUCLEAR REACTOR REGULATION  
WASHINGTON, D.C. 20555

July 15, 1994

NRC INFORMATION NOTICE 94-51: INAPPROPRIATE GREASING OF DOUBLE SHIELDED MOTOR BEARINGS

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert addressees to the potential for failure of safety-related equipment as a result of inappropriate greasing of double shielded motor bearings. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

Description of Circumstances

On January 20 and January 21, 1994, two different emergency diesel generator fuel oil transfer pumps failed to start at the North Anna Power Station when the motor breakers tripped on overload during testing. On January 22, 1994, the licensee tested the remaining six diesel fuel oil transfer pumps, and two more of the pump motor breakers tripped on thermal overload. These two pumps supply the same diesel generator. Consequently this diesel generator was declared inoperable.

There are eight fuel oil transfer pumps at North Anna; two redundant pumps supply each of the station four emergency diesel generators from underground fuel oil storage tanks. The transfer pumps are located in an unheated building near the fuel oil tanks. This building is continuously supplied with outside air to reduce the oil fumes. As a result, the temperature in the building was about the same as that of the outdoor air, which was abnormally cold: -15°C [5°F]. The licensee installed temporary heaters in the building and, after a short warmup period, successfully tested all of the transfer pumps.

Discussion

The licensee investigation of the problem showed that the failures to start the pumps were caused by excessive grease in the motor bearings, which became very stiff at the abnormally low temperatures. This caused abnormally high starting loads that prevented the motor from accelerating past the low

9407080037

updated on 7/15/94

PDR IPE Notice 94-051

940715

RF01  
11

104R-11c

rotational speeds that cause the motor to draw high starting currents. The sustained high starting currents caused the motor power supply breaker thermal overload devices to trip.

This determination was confirmed by placing the motors in a freezer for 2.5 hours at  $-14^{\circ}\text{C}$  [ $6^{\circ}\text{F}$ ] and applying power to them. At this temperature some of the motors drew 6 amperes when the rated 460 volts were applied to the motor terminals, compared to the rated full load current of 0.75 amperes. These motors continued to run at a slow speed in the start-up current range. When tested at the same temperature after the bearings were replaced, the motors ran at normal speed and drew only 0.4 amperes.

The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that 7 of the 8 motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting loads, but could also cause the bearing to overheat and solidify the grease under normal operating conditions.

#### Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.



Brian K. Grimes, Director  
Division of Operating Reactor Support  
Office of Nuclear Reactor Regulation

Technical contact: Rick McWhorter, RII  
(703) 894-5421

Attachment:  
List of Recently Issued NRC Information Notices

LIST OF RECENTLY ISSUED  
 NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-50	Failure of General Electric Contactors to Pull in at the Required Voltage	07/14/94	All holders of OLs or CPs for nuclear power reactors.
94-49	Failure of Torque Switch Roll Pins	07/06/94	All holders of OLs or CPs for nuclear power reactors.
94-48	Snubber Lubricant Degradation in High-Temperature Environments	06/30/94	All holders of OLs or CPs for nuclear power reactors.
94-13, Supp. 1	Unanticipated and Unintended Movement of Fuel Assemblies and other Components due to Improper Operation of Refueling Equipment	06/28/94	All holders of OLs or CPs for nuclear power reactors.
94-47	Accuracy of Information Provided to NRC during the Licensing Process	06/21/94	All U.S. Nuclear Regulatory Commission Material Licensees.
94-46	NonConservative Reactor Coolant System Leakage Calculation	06/20/94	All holders of OLs or CPs for nuclear power reactors.
94-45	Potential Common-Mode Failure Mechanism for Large Vertical Pumps	06/17/94	All holders of OLs or CPs for nuclear power reactors.
94-44	Main Steam Isolation Valve Failure to Close on Demand because of Inadequate Maintenance and Testing	06/16/94	All holders of OLs or CPs for nuclear power reactors.
94-43	Determination of Primary-to-Secondary Steam Generator Leak Rate	06/10/94	All holders of OLs or CPs for pressurized water reactors.

OL = Operating License  
 CP = Construction Permit

rotational speeds that cause the motor to draw high starting currents. The sustained high starting currents caused the motor power supply breaker thermal overload devices to trip.

This determination was confirmed by placing the motors in a freezer for 2.5 hours at -14°C [6°F] and applying power to them. At this temperature some of the motors drew 6 amperes when the rated 460 volts were applied to the motor terminals, compared to the rated full load current of 0.75 amperes. These motors continued to run at a slow speed in the start-up current range. When tested at the same temperature after the bearings were replaced, the motors ran at normal speed and drew only 0.4 amperes.

The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that 7 of the 8 motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting torques, but could also cause the bearing to overheat and solidify the grease.

Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

*Original signed by*

Brian K. Grimes

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical contact: Rick McWhorter, RII  
 (703) 894-5421

Attachment:  
 List of Recently Issued NRC Information Notices  
 \*See previous concurrence

OFFICE	*OGCB:DORS	*TECH ED	*C/EELB:DE	*REGION II	*REGION II
NAME	DCKirkpatrick		CHBerlinger	RMcWhorter	ABelisle
DATE	05/03/94	05/02/94	05/26/94	06/06/94	06/20/94
*REGION II	*AC/OGCB:DORS	D:DORS			
JRJohnson	RLDennig	BKGrimes			
06/20/94	06/20/94	07/8/94			

rotational speeds that cause the motor to draw high starting currents. The sustained high starting currents caused the motor power supply breaker thermal overload devices to trip.

This determination was confirmed by placing the motors in a freezer for 2.5 hours at -14°C [6°F] and applying power to them. At this temperature some of the motors drew 6 amperes when the rated 460 volts were applied to the motor terminals, compared to the rated full load current of 0.75 amperes. These motors continued to run at a slow speed in the start-up current range. When tested at the same temperature after the bearings were replaced, the motors ran at normal speed and drew only 0.4 amperes.

The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that seven of the eight motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting torques, but could also cause the bearing to overheat and solidify the grease.

Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical contact: Rick McWhorter, RII  
 (703) 894-5421

Attachment:  
 List of Recently Issued NRC Information Notices  
 \*See previous concurrence

OFFICE	*OGCB:DORS	*TECH ED	*C/EELB:DE	*REGION II	*REGION II
NAME	DCKirkpatrick		CHBerlinger	RMcWhorter	ABelisle
DATE	05/03/94	05/02/94	05/26/94	06/06/94	06/20/94

*REGION II	*AC/OGCB:DORS	D:DORS
JRJohnson	RLDennig	BKGrimes
06/20/94	06/20/94	06/ /94

DOCUMENT NAME: GREASMTR.IN *mkm*

rotational speeds that cause the motor to draw high starting currents. The sustained high starting currents caused the motor power supply breakers thermal overload devices to trip.

This determination was confirmed by placing the motors in a freezer for 2.5 hours at -14°C [6°F] and applying power to them. At this temperature some of the motors drew 6 amperes, when the rated 460 volts were applied to the motor terminals, compared to the rated full load current of 0.75 amperes. These motors continued to run at a slow speed in the start-up current range. When tested at the same temperature after the bearings were replaced, the motors ran at normal speed and drew only 0.4 amperes.

The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that seven of the eight motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting torques, but could also cause the bearing to overheat and solidify the grease.

Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical contact: Rick McWhorter, RII  
 (703) 894-5421

Attachment:  
 List of Recently Issued NRC Information Notices  
 \*See previous concurrence

OFFICE	*OGCB:DORS	*TECH ED	*C/EELB:DE	*REGION II	*REGION II
NAME	DCKirkpatrick		CHBerlinger	RMcWhorter	ABelisle
DATE	05/03/94	05/02/94	05/26/94	06/06/94	06/20/94

*REGION II	AC/DORS	D:DORS
JRJohnson	RLBennig	BKGrimes <i>gll</i>
06/20/94	06/10/94	06/ /94

rotational speeds that cause the motor to draw high starting currents. The sustained high starting currents caused the motor power supply breakers thermal overload devices to trip.

This determination was confirmed by placing the motors in a freezer for 2.5 hours at -14°C [6°F] and applying power to them. At this temperature some of the motors drew 6 amperes, when the rated 460 volts were applied to the motor terminals, compared to the rated full load current of 0.75 amperes. These motors continued to run at a slow speed in the start-up current range. When tested at the same temperature after the bearings were replaced, the motors ran at normal speed and drew only 0.4 amperes.

The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that seven of the eight motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting torques, but could also cause the bearing to overheat and solidify the grease.

Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical contact: Rick McWhorter, RII  
 (703) 894-5421

Attachment:  
 List of Recently Issued NRC Information Notices  
 \*See previous concurrence

OFFICE	*OGCB:DORS	*TECH ED	*C/EELB:DE	REGION II	REGION II
NAME	DCKirkpatrick		CHBerlinger	RMcWhorter	A. Kiessel MSinkule
DATE	05/03/94	05/02/94	05/26/94	06/06/94	06/20/94

REGION II	AC/OGCB:DORS	D:DORS
ORJohnson	RJKiessel	BKGrimes
06/20/94	06/ /94	06/ /94

6.0 amps of current, compared to the name plate rating of 0.75 amps, and ran at a speed that was slower than normal. When tested at the same temperature after the bearings were replaced, the motors drew only 0.4 amps and ran at normal speed.

~~These motors are Westinghouse Model TBEP, Style 72A35856, 1/2-horsepower motors. They operate on 460 volts ac at 3525 rpm. The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that seven of the eight motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting torques, but could also cause the bearing to overheat and solidify the grease.~~

Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical contact(s): Rick McWhorter, RII  
 (703) 894-5421

Attachment:  
 List of Recently Issued NRC Information Notices

\*See previous concurrence

*Q/H/B*

OFFICE	*OGCB:DORS	*TECH ED	C/EELB:DE	REGION II	REGION II
NAME	DCKirkpatrick		CHBerlinger	RMcWhorter	MSinkule
DATE	05/03/94	05/02/94	05/21/94	05/ /94	05/ /94

REGION II	AC/OGCB:DORS	D:DORS
JRJohnson	<del>AJKugler</del> <i>RJKirch</i>	BKGrimes
05/ /94	05/ /94	05/ /94

DOCUMENT NAME: GREASMTR.IN

6.0 amps of current, compared to the name plate rating of 0.75 amps, and ran at a speed that was slower than normal. When tested at the same temperature after the bearings were replaced, the motors drew only 0.4 amps and ran at normal speed.

These motors are Westinghouse Model TBEP, Style 72A35856, 1/2-horsepower motors. They operate on 460 volts ac at 3525 rpm. The motor bearings are of the double shielded type, which are supplied by several different manufacturers, and normally require no greasing after they are installed. However, station records showed that seven of the eight motors had been greased every 18 months since 1986. The old bearings were found to be completely full of grease. According to the bearing vendors, a high grease content inside the bearing shields could not only cause high starting torques, but could also cause the bearing to overheat and solidify the grease.

Related Generic Communications

NRC Information Notice 88-12, "Overgreasing of Motor Bearings," April 12, 1988.

NRC Information Notice 93-26 and Supplement 1, "Grease Solidification Causes Molded-Case Circuit Breaker Failure To Close," April 7, 1993, and January 31, 1994.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the technical contact listed below or the appropriate Office of Nuclear Reactor Regulation project manager.

Brian K. Grimes, Director  
 Division of Operating Reactor Support  
 Office of Nuclear Reactor Regulation

Technical contact(s): Rick McWhorter, RII  
 (703) 894-5421

Attachment:  
 List of Recently Issued NRC Information Notices

\*See previous concurrence

OFFICE	OGCB:DORS	TECH ED	C/EELB:DE	REGION II	REGION II
NAME	DCKirkpatrick		CHBerlinger	RMcWhorter	MSinkule
DATE	05/3/94	05/2/94	05/ /94	05/ /94	05/ /94
REGION II	AC/OGCB:DORS	D:DORS			
JRJohnson	<i>Kessel</i> AJKugler	BKGrimes			
05/ /94	05/ /94	05/ /94			

DOCUMENT NAME: GREASMTR.IN